

## Backcross breeding to improve common blight resistance in South African bean cultivars

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Dry beans are an important leguminous food crop grown in South Africa, and approximately 58 000 tons are produced annually by commercial and small-scale farmers. Common bacterial blight (CBB), caused by *Xanthomonas axonopodis* pv. *phaseoli* (Xap) is a major disease limiting dry bean production in South Africa. In Eastern and Southern Africa it has been reported in 19 of the 20 bean producing countries and is considered one of the five most important and widespread biotic constraints in dry bean production in sub-Saharan Africa (Gridley, 1994). All locally grown commercial cultivars are susceptible to the disease and development of resistant cultivars is essential. An important objective of the breeding program at the Agricultural Research Council- Grain Crops Institute (ARC-GCI) is to improve CBB resistance of commercial cultivars by means of backcrossing.

### Material and Methods

XAN 159, resistant to local Xap isolates, was used as donor parent in a backcross programme to improve resistance of 2 local cultivars, Teebus (small white canning bean) and Kranskop (high yielding speckled sugar). These cultivars were selected on the basis of the commercial value. Artificial inoculations with a mixture of 5 highly virulent Xap strains ( $10^7$  CFU/ml), were used in greenhouse studies to evaluate segregating populations, using the multiple-needle inoculation method (Andrus, 1948). Plants were rated on a 1-9 scale with 1 being highly resistant and 9 highly susceptible. In addition to phenotypic disease reaction, existing SCAR markers (Miklas *et al.*, 2000) were tested on identified resistant lines. Polymerase chain reactions (PCR) were done based on the protocol of Williams *et al.*, (1990). SCAR markers SU91, BC420 (linked to major QTL from XAN 159) and SAP6 (linked with major QTL derived from GN Nebr. Sel 27) were used in the same PCR reaction at 58°C annealing temperature (Miklas *et al.*, 2000).

### Results and Discussion

Backcrossing with Teebus as recurrent parent has progressed to the completion of BC5. Progeny of these lines were tested for homogeneity and although segregation was still evident, high levels of resistance were observed (plants rated 1). Presence of both SU91 and BC420 markers in BC5F3 progeny confirmed successful transfer of resistance (Fig. 1). These lines are currently being evaluated for field resistance as well as other agronomic traits. Greenhouse screening results indicated that resistance in developed lines were superior to that of XAN 159. This could be as a result of combined resistance from GN Nebr. sel 27 (marker SAP6 present)(Fig. 1) and XAN 159. Marker SAP6 was present in both Teebus and Kranskop (Fig. 1) and could have been introduced by parents used in developing these cultivars.

Progress in improvement of CBB resistance in Kranskop, has had limited success. Only moderate levels of resistance were observed in lines with acceptable seed colour, derived from

crosses with XAN 159. Presence of marker BC420 (absent in these lines)(Fig. 1) seems important to obtain high levels of resistance. Other sources of resistance are being exploited for use in this backcross programme. Resistant lines with seed colour unacceptable for the South African market can, however, be made available to other African countries, where a wider range of market classes are being planted.

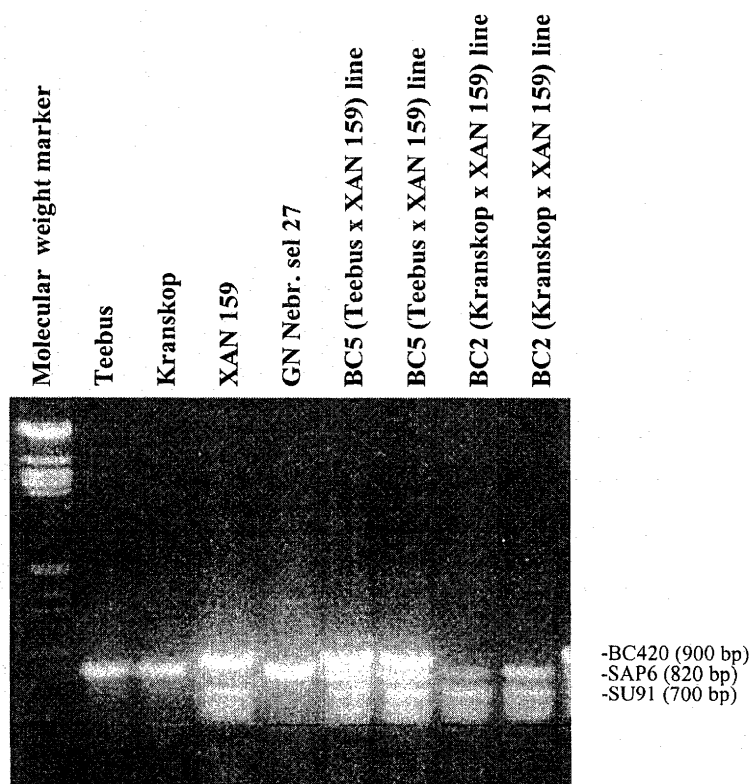


Figure 1. Screening of cultivars and lines from the ARC-GCI breeding programme for CBB resistance using SCAR markers BC420, SAP6 and SU91.

### Literature Cited

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